REMARKS

In response to the Notice of Non-compliant Amendment, please accept the attached corrected set of claims.

The rejection of claims 6, 27-28 under 35 USC 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, is now moot in that claims 6, 27-28 have been cancelled and replaced by new claims 41, 42 and 43, all of which depend from claim 1.

New claims 41, 42 and 43 have been drafted in view of the Examiner's remarks in the rejection of claims 6, 27-28 under 35 USC 112.

The rejection of claims 1-2, 21-31, 34-37 and 40 under 35 USC Section 103 as being unpatentable over US Patent Publication to Nakamura as well as being unpatentable over JP 02047238 is respectfully traversed.

Claim 1 has been amended to clearly define the magnesium base alloy as a die-casting alloy having high strength resistance and high tensile yield strengths at elevated temperatures of at least up to 175°C, consisting of each of the elements listed in paragraph (i) to paragraph (vii) and minor amounts of other elements with each of the other elements not exceeding .03 wt. %. The amendment of claim 1 clearly limits the elements in claim 1 to essentially the seven elements in (i) to (vii) having limited ranges. The Nakamura composition does not teach a magnesium based alloy which is essentially limited to only seven elements much less within the ranges set forth in claim 1. In fact, Nakamura teaches ranges for some of the elements that exceed the range recited in claim 1 by a factor of 10 or more. Moreover, the alloy of the present invention as set forth on page 9 must contain calcium limited to the range of 1.8 to 3.2 wt.%. If the calcium concentration is lower than 1.8 wt.% the creep resistance will be too low and if the calcium concentration exceeds 3.2 wt.%, this promotes embrittlement. More surprisingly and in accordance with the present invention, the presence of tin markedly improves the

castability of the alloy and eliminates sticking of the alloy to the die. However, the tin concentration must be limited to within the range of 0.3 to 2.2 wt.%. A tin addition higher than 2.2 wt. % leads to a decrease in the alloy strength. Furthermore, as set forth on page 10, zinc may be added up to 0.8 wt. % to improve strength at ambient temperature but at more than 0.8 wt.%, zinc causes hot cracking. Accordingly, for the above reasons along, claim 1 is clearly patentable over Nakamura and JP 02047288.

It should also be pointed out that the teaching of calcium in Nakamura in paragraph (0037) is to be optionally selected from 16 different rare earth elements and from a high and indefinite number of their mixtures. It is difficult to understand how the Examiner can assume from this teaching that it would be obvious to Nakamura to include calcium as an element of the alloy composition, much less within the range taught by applicant.

The selection of entirely different ranges of element concentrations in this application, compared to Nakamura, leads to achieving the desired physical properties, namely TYS, CYS and creep resistance at temperatures of up to 200°C. The Examiner's statement that Nakamura discloses alloys with higher strength than this application (Par. 9) is based, most likely, on overlooking the difference between tensile yield strength (TYS) and ultimate yield strength (UTS). Nakamura relates in Figures 6, 8, 11 and 12 to UTS values at room temperature, while this application claims high TYS at room and elevated temperatures, and low minimum creep rate (MCR). TYS is the stress required for producing a small specific amount of plastic deformation, which is usually specified for the strain of 0.2%. UTS is equal to the maximum load divided by the original cross-section of the test specimen, and relates to high deformations of 3%-20%, depending on the alloy ductility. It is therefore the TYS value that is the most important property of the alloy for determining the usable elastic behavior for engineering purposes.

This invention provides alloys that retain high yield strength at temperatures of at least up to 175°C. Nakamura's alloys loses both tensile yield strength

and ultimate tensile strength when the operating temperature exceeds 100°C, since they contain high concentrations of Al, Zn and Sn which are bound with magnesium into low melting point intermetallic compounds. Such compounds soften at higher temperatures and cause deterioration of mechanical properties. In addition, the present application provides alloys with high CYS and creep resistance at high temperatures.

For all of the above reasons, claim 1 is clearly patentable over Nakamura taken alone or JP 02047238 taken separately. As regards the teaching of JP 02047238, applicant wishes to further point out that the JP composition teaches 27 elements, whereas the composition taught in claim 1 consists essentially of 7 elements and does not teach the limited concentration ranges for the 7 elements as specified in claim 1.

In addition, the cited JP '238 reference relates to an entirely different application involving the manufacture of a vibration-damping alloy (like ingot casting) which has nothing in common with high pressure die-casting requiring high strength creep resistance and high tensile yield strengths at elevated temperature.

The rejection of claim 6, 31-33 and 37-39 under 35 USC 103(a) as being unpatentable over the references cited in the rejection of claims 1 and 2 in combination with USP 6,139,651 to Bronfin is respectfully traversed. All of the claims 6, 31-33 and 37-39 are dependent claims, which are dependent upon claim 1 and are therefore believed to be patentable for all of the reasons given heretofore. It should further be pointed out that new claim 41 replaces cancelled claim 6 and new claims 42 and 43 replace cancelled claims 27 and 28, but are otherwise substantially similar in scope.

Applicant wishes to draw the Examiner's attention to Tables 2 and 6 of Bronfin. A comparison with Table 4 of this application shows that Bronfin teaches compounds, for example $Mg\text{-}Al\text{-}Sn_{56}$, $Mg\text{-}AlZn\text{-}Sn_{56}$, $Al_2(Ca,Sn)$ and $Al_2(Ca,Sn,Sr)$, etc. which are not being claimed in this case. Structural differences are accompanied by differences in the mechanical properties of the alloys. With respect to the creep rate, for example, it can be seen that the alloys in Bronfin show significantly higher minimum

creep rate values (MCR) than taught in this application, the values being about 7.5-$15.8x10^{-9}s^{-1}$ (Bronfin patent reports the values as the ratio MCR/TYS) compared to 0.8-$1.8x10^{-9}s^{-1}$ for the new alloys of this application (compare Table 5 of this application and Tables 4 and 8 of Bronfin). Bronfin reports creep rates under conditions of 135°c/85 Mpa, whereas this application reports creep rates under conditions of 150°C/100 Mpa or 200°/55 Mpa. As for TYS, the alloys of this application overcome the alloys in Bronfin, as seen when comparing Table 5 of the application with Table 4 and 8 of the patent.

For all of the above reasons, claim 6, now claim 41 and claim 31-33 and 37-39 are believed to be clearly patentable over the cited references even in combination with Bronfin '651.

Reconsideration and allowance of claims 1, 2 and 21-43 is respectfully solicited.

Respectfully submitted,

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MAILING CERTIFICATE

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed: Commissioner of Patents & Trademarks, Washington, DC 20231 on February 12, 2004.

Mary Washburn
Feb. 12, 2004